



Consommation  
et Corporations Canada

Consumer and  
Corporate Affairs Canada (21) (A1)

2,033,054

Bureau des brevets

Patent Office (22)

1990/05/03

Ottawa, Canada  
K1A 0C9

(43)

1990/12/01

(52)

350-56

6,009,3/22

(51) INTL.CL.<sup>5</sup> H04N-007/173

(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Entertainment and Services Systems

(72) McSpirt, Charles - U.K. ;  
Wade, John G. - U.K. ;  
Harvey, Colin M. - U.K. ;  
Spriggs, Timothy J. - U.K. ;

(73) GEC-Marconi Limited - U.K. ;

(30) (GB) 8912474.7 1989/05/31

(57) 19 Claims

Notice: The specification contained herein as filed

Canada

CCA 3254 (10-89) 41



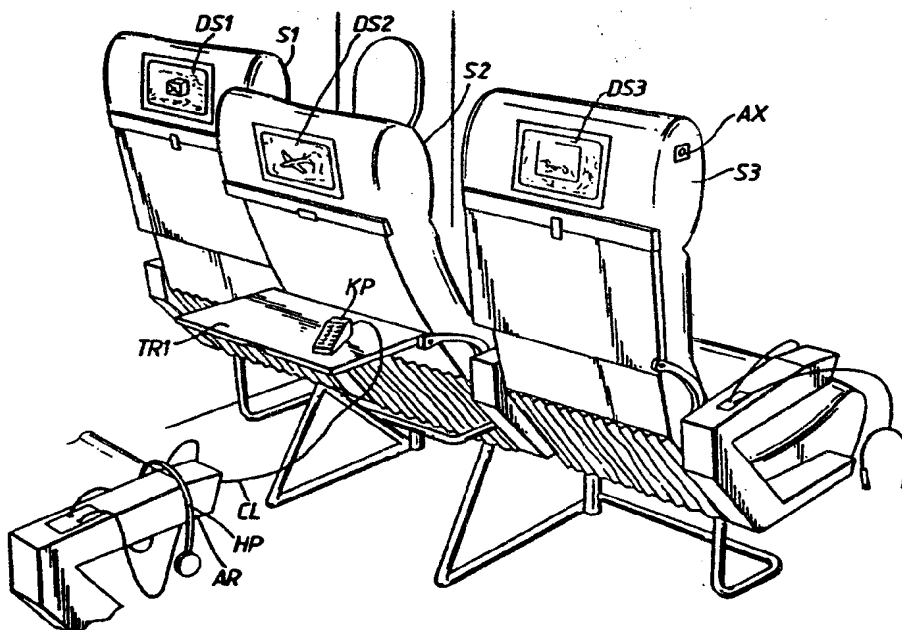
PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> : H04N 7/173, H04H 1/00 B64D 11/00		A1	(11) International Publication Number: WO 90/15508
			(43) International Publication Date: 13 December 1990 (13.12.90)
(21) International Application Number: PCT/GB90/00681		(74) Agent: FISH, Norman; The Plessey Company Limited, Intellectual Property Department, Vicarage Lane, Ilford, Essex IG1 4AQ (GB).	
(22) International Filing Date: 3 May 1990 (03.05.90)			
(30) Priority data: 8912474.7 31 May 1989 (31.05.89) GB		(81) Designated States: AT (European patent), AU, BE (European patent), BG, BR, CA, CH (European patent), DE*, DE (European patent)*, DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), IT (European patent), JP, KR, LU (European patent), NL (European patent), NO, SE (European patent), SU, US.	
(71) Applicant (for all designated States except US): GEC-MARCONI LIMITED [GB/GB]; The Grove, Warren Lane, Stanmore, Middlesex HA7 4LY (GB).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): McSPIRIT, Charles [GB/GB]; 199 Southwood Road, Hayling Island, Hampshire P011 9PZ (GB). WADE, John, Gordon [GB/GB]; 23 Norris Gardens, Warblington, Havant, Hampshire P09 2UT (GB). HARVEY, Colin, Micheal [GB/GB]; 16 Lulworth Close, Hayling Island, Hampshire P011 ONY (GB). SPRIGGS, Timothy, John [GB/GB]; 23 Island Close, Hayling Island P011 ONJ (GB).		Published With international search report.	

(54) Title: IMPROVEMENTS RELATING TO ENTERTAINMENT AND SERVICES SYSTEMS



## (57) Abstract

An integrated entertainment and services system for aircraft etc. comprises an hierarchical structure including top level computer/data base, communications and entertainment equipments which are accessible through intermediate level switching equipment which in turn is selectively accessible to specific seat terminal locations including display screens and controller devices through low level switching equipment.

## IMPROVEMENTS RELATING TO ENTERTAINMENT AND SERVICES SYSTEMS

This invention relates to entertainment and services systems and relates more specifically to integrated entertainment and services systems for use in passenger carrying vehicles (e.g. aircraft), hotels, stadiums, etc. for providing a wide range of selected entertainment and services at specific terminal (e.g. seat) locations.

One major problem with an integrated entertainment and services system required to provide the various facilities as set out hereinafter aboard a passenger carrying vehicle for example is that of getting signals from a multiplicity of wide-band sources to individual users on request when the necessary bandwidth is impractically large to transmit all channels to all terminals for local selection.

Supplementary problems involve inter-system interference and reliability, especially on a passenger-carrying vehicle; communicating by voice with remote persons within the same installation or externally; communicating 'electronically', particularly with or from a passenger carrying vehicle; ease of use of system; the availability of a small number of attendants coping with a lot of persons wishing to pay for goods and services at the same time; and the businessman away from home or office needing access to word processing or other software packages, particularly on a passenger carrying vehicle.

The present invention has in view a combined entertainment and services system for use in multiple passenger carrying vehicles,

2033054

2

hotels, conference centres, stadiums, etc. In such a system each seat position in a vehicle for example may be provided with a terminal comprising a display screen, audio transducers, and controller enabling the selection by a customer of a range of entertainments and services. The system may be such as to allow simple addition or removal of services and utilities to suit customer requirements. It is envisaged that one or more of the following basic entertainments and services will be provided in the system according to the inventor.

#### Video Games

These are computer generated interactive games similar to those found in amusement arcades and on domestic games computers. The user may play them using the video, audio and controller facilities of their terminal.

#### Casino Games

These are computer representations of games involving gambling, including card games and 'slot machines'. The user may play them using the video, audio and controller facilities of their terminal. Credits may be entered into the system before play to be used as gaming 'chips' or machine tokens.

#### Video Films and Audio Programmes

Provision may be made for the play-back and transmission over the system to the user terminals of pre-recorded video and audio programmes; the typical provision is for eight video channels and sixteen audio channels of which eight are video sound-track. All

2033054

of these shall be capable of carrying high quality stereo signals. The provision may be expanded upon by the use of additional equipment.

#### Mail Order

Merchandise catalogues may be stored in the system database which is accessible to customers via their terminals. Whilst the database is being accessed for a specific page or topic, advertising may be shown.

#### Duty Free Sales

Systems installed in passenger carrying vehicles that cross national boundaries where duty free sales are allowed may hold a catalogue of such items in the database which is accessible from terminals by the passengers. Such goods could be handed to passengers when leaving the vehicle or be picked up within the destination terminal.

#### Other Goods Sales

A catalogue of souvenir items specific to the system operator or other goods for immediate delivery to, or later collection by, the user may also be provided and accessible from the user's terminal. This may be used to facilitate "Room Service" in hotels, etc.

#### Bureau de Change

Where required and where allowed by law the system may be used to facilitate currency exchange between currencies identified in the system database.

2033054

4

Transaction Currency

Payments into the system may be accepted in any of the currencies supported for currency exchange. Credit available for use by passengers can be represented in the currency of their choice.

Advertising

The system may provide for the storage and display at the user terminals of advertising material from an advertisement database. This may include short still advertisements (which may be randomly accessible) and short animated advertisements held digitally; also pre-recorded video material programmed with film, news, etc.

Communication Services

Telephone like facilities may be provided between users of the system, enabling communication between people seated in different parts of the building, vehicle, etc. The system may also provide an interface with a public communications system, such as satellite communications or a terrestrial flight telephone system, which would enable the user terminals to be used as telephones (air to ground, ship to shore, etc). The main system terminal may also have facsimile or telex capability.

Reservations

This facility offers a reservation service which may be for travel, including car hire, air travel, sea travel, etc; accommodation, including hotels; and services such as restaurant bookings, etc. A

menu of reservations may be held in the database and presented to the user's terminal on demand for selection as required. Such services may be franchised to a major travel agent, hotel chain, etc. The bookings may be confirmed using the communications facility.

#### User Access to System

The individual user interfaces may be as follows:-

A visual display screen (usually of not less than twelve square inches picture area) providing good quality full colour video film reproduction. This screen may be suitable for installation in walls or bulkheads, tables or desks, seat backs or armrests, etc. The display may be adjustable for brightness to account for the range of ambient illumination that will be encountered in service.

A control unit/keypad may allow selection of all facilities and control of games. If it is to be used on an umbilical cable, or without physical attachment, it should be light weight and easy to handle. A number of key switches and a means of moving a screen cursor may be provided on the keypad.

Provision may be made for the use of a security "key" to prevent use of a terminal by unauthorised personnel whilst the rightful user has left it unattended.

A credit, charge or debit card reader may be fitted to facilitate payment for services. Cards may be checked against a "hotlist" from the card company held on the system database and/or accessed via the communications services. The list of acceptable cards may be programmed according to the requirements of the system operator.

**2033054**

An audio headset may provide high quality stereo reproduction. This may be easily disconnected via a jack plug or similar arrangement for sanitization after use.

A microphone may provide telephone quality audio as a minimum and may form part of the keypad or headset. Whatever installation position is used the microphone may be easily accessible for sanitization after use.

Operation of the system by the user may be as simple as possible using on-screen prompts and easily followed menu presentations.

The terminal units may be detachable for maintenance purposes using special tools. This enables replacement of damaged units by authorised persons, but discourages theft or entry by others.

Provision could also be made for the attachment of more capable terminals for passenger use to run business applications, word processing, etc. Hard copy print-outs could be provided by a senior attendant's terminal mentioned below.

#### Hard Copy Receipts and Vouchers

The system may provide printed copies of all passenger net balances at end of flight. Transactions between any attendant and the user may be confirmed with a hard copy voucher at the point of sale.

#### Information Services

For a passenger carrying vehicle, such information as vehicle position, speed, distance travelled, time remaining, estimated time of



arrival and weather at destination may be displayed as well as data specific to particular types of vehicles such as altitude in the case of an aircraft. Vehicle position may be represented on the display screen by means of a moving symbol on a map. For hotel applications details of meal times, sports facilities available, local attractions, etc could be provided.

Control and supervision of the system may be achieved via the system supervisor's or senior attendant's terminal. This may comprise a display, full function keyboard and printer. It may also provide removable data storage media for removal of accounts, usage statistics, etc. for remote analysis.

#### Attendant's Portable Terminals

A portable terminal may be available for attendants who are to assist users at their seat. This may comprise a display, alpha-numeric entry key board, printer, and may also have a card reader for credit, charge or debit cards. There may be memory provision so that any accounting, or other data can be carried back to the senior attendant's terminal, if necessary. The terminal may be lightweight and easily held in one hand while operated with the other, it may be supported by a shoulder strap or similar. It may also be built into other equipments such as service trolleys etc.

#### Interfaces

The system may need to provide interfaces to other installations in order to carry out some of its operations. These may include the following:-

**2033054**

The audio distribution system may interface with any existing public address system in the place of installation and accept external commands for safety announcement override.

Interface may be provided to navigation systems on a vehicle.

Communications interfaces depend on the location of the installation, but may include satellite communications systems; line of sight VHF/UHF air to ground, ship to shore, etc; standard data transmission systems; etc.

Utilities, such as reading lights, attendant call, etc.

### Security

The potential value of financial transactions handled by the system may be very high, therefore high security of the system against unauthorised access or deliberate change may be essential. The level of security achieved for a particular installation will usually be determined by cost and degradation of other system features such as ease of use, response time, reliability, size and weight. The security measures may include limits to physical access to system components, encoding of data, passwords and other identifiers, data validity checking and physical 'keys' etc.

### Service Quality

Built in test facilities may provide an indication to the attendants or system supervisor of any system failures and degradation (partial failure).

### System Statistical Data

2033054

Statistical data may be collected and stored on the system database and may be easily transferred to an external database via the communications services or via removable storage media. These statistics may include information on the use of games, advertisements shown, system maintenance requirements and any operator-specific requirements.

European Patent Application No. EP 0 277 014 entitled "Service and Entertainment Communication System" describes a system providing some of the above-mentioned facilities, in which a communication mechanism is provided wherein audio signals are encoded into a video channel and frequency division multiplexed on to a transmission medium with other video signals. Each receiving terminal contains tuners for the selection of specific video and audio signals from the multiplexed ensemble. This system has limited scope for future enhancement in terms of numbers of channels provided. The bandwidth of the long transmission paths throughout the installation needs to be sufficient to carry all the channels at once.

One objective of this invention is to provide a system featuring a different entertainment programme or service selection mechanism which enables additional programme material to be added later without increase in bandwidth on the long transmission paths.

United States Patent Serial No. 4 647 980 entitled "Aircraft Passenger Television System" described a system having a viewing screen at each seat fed from several video sources such that each screen is integrated with a channel selector to select one video for

**2033054**

10

display. A "television module" is provided incorporating channel selection controls, etc. with the display screen.

Another objective of this invention is to provide a system which does not incorporate channel selection controls or tuners with the display. Such controls would constitute a nuisance to the occupant of the seat in front of installations implementing displays in seat backs.

Moreover, the system described in United States Patent Serial No. 4 647 980 is incapable of two-way signal transmission between a central unit and a plurality of remote units mounted on aircraft passenger seats, and is incapable of transmitting signals other than video programmes (e.g. computer game programs) from a central unit to a plurality of remote units. It is desirable for the system to have the capability for both.

In both European Patent Application No. EP 0 277 014 and United States Patent No. 4 647 980, a headset is attached to the seat in front of the seat location where the services, etc. are provided. This impedes passenger access to the aisles and thus presents an unacceptable safety hazard on a passenger carrying vehicle.

The headset, any microphone and controlling keypad should desirably be attached to the arm of the seat occupied by the user and should preferably be easily detachable by the attendant so as to be collected for sanitization, as necessary, after use.

United States Patent Serial No. 4 584 603 entitled "Amusement and Information System for Use on a Passenger Carrier" describes a system on a passenger carrier having a plurality of seats with a display on the back of each seat, a 'key means' connected to each

display and a set of transparent plastic trays through which the display may be viewed when the tray is stowed away. This arrangement may be ergonomically undesirable for the reason that, if the tray is at the optimum height, the display is too low for comfortable viewing. Alternatively, if the display is at optimum height the tray will be too high.

It is desirable therefore that the system does not feature such a tray, but the fitting of a conventional seat back tray to each seat as required is not precluded. It is also not essential to have the display mounted in a seat back; it could, for example, be mounted on an articulated arm assembly attached to the seat arm.

In an integrated entertainment and services system the problem of getting signals from a multiplicity of sources to the individual system users on request when the bandwidth of sending all channels to all user terminals would otherwise be impractically large is overcome by providing in accordance with the present invention an integrated entertainment and services system such as for use in aircraft comprising an hierarchical data transmission structure with signal sources localised at one or more centres at an upper level of the hierarchical structure whereas at the lower level of the structure all the user terminals are split up into small groups (e.g. associated with one multiple seat assembly on an aircraft) each of which is serviced by a local communications box, in which only those signals requested by the users in a particular group are sent to the communications box thus limiting the transmission link bandwidth to  $N$  times the single channel bandwidth, where  $N$  is the number of units in the local group, in which at an intermediate level

**2033054**

of the hierarchical local structure the local groups are grouped together to form a small number of super groups each serviced by a zone concentrator and in which the concentrator accepts service and entertainment material from a multiplicity of video, audio and data sources, the high bandwidth channels being required for this being few compared to many cable runs between concentrators and communication boxes.

In carrying out the invention it is not essential to have all the material sent to all the concentrators. Some operators may wish to provide different material to different zones, this is easily accommodated in the installation cabling.

In large systems additional levels may be provided in the hierarchical structure which can be implemented as required to limit the 'span of control'.

For safe and reliable operation, all of the systems on a passenger vehicle must be compatible in operation. Hitherto, a major source of incompatibility has been due to electromagnetic interference. Some systems may be susceptible to incorrect operation as a result of electromagnetic fields impinging on them so it is necessary to ensure that other vehicle systems do not radiate such fields. On a more mundane level, however, external electromagnetic interference could cause problems with the picture or sound quality of the services and entertainment system provided and although this is not a direct hazard to safety it can result in loss of trade. Two features of the system according to the present invention cut down the possibility of interference with or from other systems. One is the limited bandwidth of the majority of

communications links and the second may be provided by the use of optical transmission. Optical signals, particularly in waveguides such as fibres, do not couple electromagnetically with other systems in such a manner as to cause interference. The converse also holds, the system of the invention cannot be affected by electromagnetic coupling with the optical signals.

The detailed scrutiny of the services and entertainment system of this invention by users will demand high system reliability, particularly on a passenger vehicle where qualified maintenance personnel are unlikely to be immediately available. Failures at the top level of the hierarchical structure will affect all the users whereas the failure of one audio or video source will not cause too much inconvenience since there will still be other channels to choose from. Failure of a main computer in the top level of the hierarchical structure will in effect remove access to all material for which charges are levied and this is clearly undesirable. The use of multiple redundant equipments in the system overcomes this problem since in case of failure of one equipment another can take over and sustain system operation until maintenance actions can be carried out. In case of failure of single terminals or groups the attendant can enter the information via a senior attendant's terminal so that the system can print out maintenance requirements at appropriate times (e.g. at the end of the journey in the case of a vehicle). The controller keypad, which is most prone to damage by users, can be readily replaced by an attendant possibly using a special tool.

**2033054**

The provision of a (radio) telephone and its derivatives in the system will solve the problem of communication by voice with remote persons, both local and distant. The audio channel of a video/audio entertainment system may be used as the telephone receiver. This invention enables the provision of telephone facilities on a per seat basis in a passenger vehicle, for example.

For the purpose of "communicating by data" encompassing electronic mail, telex, etc the system provides the basic hardware facilities in order to provide services and entertainment and communication by data facilities can therefore be added without the need for additional equipment on the passenger vehicle.

Once the services and entertainment system according to the invention is in place, reservations, mail order and like facilities can be provided without the need for additional equipment on the passenger-carrying vehicle or other base (e.g. hotel) for the entertainment/services system. The communications facilities allow for confirmation of reservations, or orders, before the passenger leaves the vehicle or the user leaves the hotel etc. Although such facilities as Prestel (Trademark) may be available for use in fixed places, they are not usually provided on a per room basis in hotels etc. Also, the quality and form of displayed material may be much higher in the case of the system according to the invention. For example, Prestel cannot show photographs.

The system according to the invention can be used without the need for lengthy explicit instructions.

The system of the previously mentioned United States Patent No. 4 647 980 incorporates a simple channel selection switch or



tuner. This is clearly impractical for a large number of available channels. The previously mentioned European Patent Application No. EP 0 277 014 has a similar arrangement wherein a channel number display is controlled by up and down keys to select the desired programme. In addition to this it provides a menu, on the display, of games that may be played on the local computer. This may be scrolled by the use of two different switches in order to select the game of choice. The system of this invention improves on this in two key areas. Firstly, from the point of view of the user, the same mechanism is used for selection of every optional service and entertainment programme. Secondly, the menu on the screen is multidimensional. By this is meant that, unlike the European Patent Application No. EP 0 277 014 system, it may be scrolled sideways and 'inwards'. Once the system is introduced and the user is ready the first menu page is shown and a mechanism, described below, is provided for moving a cursor. The user may either scroll down the displayed list or move sideways onto another list of selections. Once the cursor is pointing to the required option, e.g. music, a key may be pressed to select it. This either results in display of the requested information or a relevant sub-menu, e.g. types of music available, in which case the process is repeated. The mechanism for moving the cursor may be any two dimensional control means such as a joystick, tracker ball, four keys, etc. The same mechanism may be used for playing some of the video games. As a cosmetic detail the cursor may be displayed in a form relevant to the installation or to the menu selected, e.g. the silhouette of an aircraft for a flight information menu.

2033054

16

As regards the previously mentioned problem of a small number of attendants coping with a lot of people wishing to pay for goods and services at the same time, installations of the system according to this invention can cater for hundreds of users at one time and system operators will require charges to be levied for many of the services and entertainment programmes. This is straightforward in a hotel as the charges may be added to the room bill. A problem arises in conference centres, vehicles, etc where the users occupation of the terminal area is (relatively) transitory. In this case the system of the invention may provide a magnetic card reader at each user terminal. This enables the user to pay 'on line' with a credit, or similar, card. The details of the transaction will depend on the merchant agreement struck between the card company and the system operator. This is a novel feature for services and entertainment systems in general. It is also a novel feature to provide a point of sale terminal in a vehicle, particularly on a per seat basis. The reduced work load of the attendants, who only have to deal directly with cash or cheque users, is eased even more by the use of a portable terminal.

As regards the problem of the businessman away from home or office needing access to word processing or other software packages, particularly for use on a vehicle, the problem may be solved in a similar way to the communications by voice problem, most of the equipment required is inherent in the basic services and entertainment system. All that is required is the provision of a 'full function keyboard' and the appropriate software. This facility is really intended for the person wishing to prepare meeting minutes,

2033054

17

rather than the novelist, as the print out is normally to be provided centrally. A draft quality printer could be provided locally if required. Magnetic media copies could also be provided, although there are problems due to the non-standardization of such media formats.

Referring to the problem of safety of a 'seat back video' installation with trailing wires impeding access to aisles which is particularly important for emergency evacuation of a vehicle, the headset will not be attached to the seat in front, unlike European Patent Application No. EP 0 277 014 and United States Patent No. 4647980. The trailing wires impede passenger access to the aisles and thus presents an unacceptable hazard to safety on a passenger carrying vehicle. The headset, microphone and controlling keypad of the present system will instead be attached to the arm of the seat occupied by the user. They will be easily detachable by the Attendant so as to be collected for sanitization as necessary after use. The communications box for that group of seats will provide the audio and data channels directly to the seat arms, the video channel will be provided via under-floor, etc., cable connection to the seat assembly in front carrying the display device.

According to a further feature of the present invention the underfloor cabling between seats due to the need for wires to extend between seat communications boxes and system components connected respectively to the users seat (e.g. headphones), and the back of the seat in front (e.g. display screen) is avoided by a arranging that a zone concentrator utilises a switching algorithm so that data or a programme requested by a user is transmitted to a

**2033054**

18

seat communications box for the seat immediately in front of the user (i.e. the seat incorporating the display screen).

By way of example an embodiment of the invention as incorporated in a passenger carrying aircraft will now be described with reference to the accompanying drawings in which:

Figure 1 is a block schematic diagram of an integrated entertainment and services system for an aircraft;

Figure 2 is a block schematic diagram of one of a plurality of zone concentrators embodied in the system of Figure 1;

Figure 3 is a block diagram of one of a plurality of seat communications boxes incorporated in the system of Figure 1; and,

Figure 4 is a perspective view of a row of aircraft seats which shows various components of the system of Figure 1. Figure 4 is for illustration only and does not necessarily represent actual aircraft installation practice.

Referring to the drawings, the integrated flight entertainment and services system illustrated affords aircraft passengers selective access to various entertainment facilities and services, including those which have already been fully discussed, from their individual seat terminal locations. These facilities and services are provided in accordance with the invention through an hierarchical data accessing/distribution system which affords very significant economies in the number of data or communication channels required between different stages of the system as will hereinafter be readily appreciated.

The system comprises at the top of the hierarchical structure, a main computer MC which initiates and provides on-going control of

the system. The computer MC embodies a file server which provides access to system data storage means, such as file store FS, for the main computer and other computers lower down in the hierarchical structure. To ensure reliable operation and to preclude the loss of important records (e.g. accounts) in the event of main computer failure, a back-up main computer MCB with an integral file server and an associated file store FSB is provided for use to take over and thereby ensure continued service to passengers when the main computer MC fails or is taken out of service for some reason. It may here be mentioned that the data storage means or file store may be suitably partitioned so that stored data that will be changed during operation of the system (e.g. usage statistics based on previous flights) may be stored in read-write magnetic media, whereas data that is to remain constant throughout operation of the system during a flight (e.g. mail order catalogues) may be stored in read-only optical media.

The main computers MC and MCB are coupled to other parts of the hierarchical system are relatively long two-way optical transmission paths W1, W2, W3 and W4. The use of optical transmission paths which may comprise glass and/or plastic optical fibres as waveguides avoids the previously-mentioned problem of electromagnetic interference occurring between different aircraft systems when conventional electrical conductors are used for transmitting/receiving signals between system components, unless special precautions are taken as regards system installation and the screening of the aircraft system concerned to ensure integrity and

**2033054**

20

safe operation. The functions of paths W1 and W2 may be combined into one such optical path.

Transmission paths W5 and W6 are also provided between the main computers MC and MCB and their appertaining file stores FS and FSB, respectively they will be short and so need not be optical in nature. A further transmission path W7, in which may be optical, is provided between the main computers MC and MCB and an avionics interface arrangement AVI, whereby for example navigation data may be obtained for use by the Information Services facility. Data may also be sent out to other systems via avionics interface arrangement AVI. Direct access to the computers MC and MCB is provided over transmission paths W10 and W11 to appertaining senior attendants' terminals SAT and SATB, respectively, which will include keyboards, printers, disc drives etc.

For the implementation of the entertainment and services system of the present purely exemplary embodiment of the invention the aircraft is divided into eight passenger zones. These passenger zones are provided with respective so-called zone concentrators ZC1 to ZC8 which include computers, switching equipment, power distribution systems, optical interface arrangements etc. Each of these zone concentrators ZC1 to ZC8 is coupled through an optical interface arrangement OA (Figure 2) to the main computers MC and MCB, programme sources PS and a communications interface CI, by the two-way optical transmission paths W1, W3 and W4. Each of the zone concentrators serves to distribute entertainment and services data selectively, as requested, to twenty seat communications boxes, such as the boxes SB1 and SB2,

over two way optical transmission paths, such as the respective paths W8 and W9 in the case of the boxes SB1 and SB2, through an optical interface arrangement OB (see Figure 2).

The zone concentrators ZC1 to ZC8 are linked to the main computers MC and MCB by an optical local area network comprising the transmission path W1 so that the data storage means of the zone concentrator ZCO (see Figure 2) can load data via the appertaining file server into its internal memory so as to provide a quick response when data is requested by a passenger.

Zone concentrators ZC1 to ZC8 also receive over the optical transmission path W3 and via optical interface OB (Figure 2) digitised video and audio material from programme sources PS, such as video tape players, broadcast receivers, audio compact disc players, solid state storage devices etc. The sound tracks of the video programmes are routed via the audio programme transmission media. At the zone concentrator the selected audio and data signals are combined with the selected video digital signals for onward transmission over an optical transmission path, such as the path W8, to a passenger requesting that particular video programme as will be described later. This transmission over the optical paths, such as the path W8, is achieved with no overall increase in bandwidth on the video channel by inserting the audio and data samples in the period normally occupied by the frame and line synchronisation markers.

Circuits in the receiving apparatus re-constitute the video, audio and data, as necessary. Synchronisation is achieved by coding in the digital video signal. Video cameras can also be provided to give the passengers a pilot's eye view from the aircraft, for example.

**2033054**

22

The zone concentrators ZC1 to ZC8 are also arranged for handling telephone communications between aircraft passengers and other parties on or off the aircraft. An hierarchical telephone communications system may be provided to control and route communication channels. Communications between passengers within a particular aircraft zone are handled exclusively by the local zone concentrator serving that zone, whereas communications between passengers in different zones are routed by a higher level stage in the communication system via a special inter-concentrator communications path or bus W4. That communications bus W4 can also be used to link the zone concentrators ZC1 to ZC8 and thus the passengers in those zones with satellite communications terminals (not shown), UHF radio equipment etc. via a communications interface arrangement CI. A cabin management arrangement CM is also connected to the group of zone concentrators ZC1 to ZC8.

As can be seen in Figure 1, each of the seat communications boxes, such as the box SCB1, is connected to three passenger seat terminals such as the terminals PST1, PST2 and PST3. These connections between the seat communications boxes such as the seat communications box SCB1, and the seat terminals will be short and may therefore be made by way of conventional wiring arrangements. The seat communications boxes handle data flow between the associated zone concentrator and the three passengers served by the box.

From Figure 3 it will be seen that the seat communications boxes, such as the box SCB1, include an optical interface arrangement OC between the optical transmission path W8 to the zone



concentrator ZC1 and an interface arrangement OD between the box SCB1 and a readily detachable connection arrangement for an attendant's portable terminal APT.

The communications box SCB1 contains computers CMS (e.g. games computer) so that passengers may down-load and interactively run programmes (e.g. video games) and a video and audio output VA as well as a passenger keyboard interface arrangement KA. In retrofit installations an interface may be provided to existing seat arm switches SA for attendant calls, the control of reading lamps etc. The communications box SCB1 also includes a telephone coder/decoder arrangement TCD for passenger voice communications purposes.

From Figure 3 it will be seen that the passenger seat terminal PST3 includes a hand-held keypad KP which may embody a magnetic card reader CR, and a microphone MA, headphones HP and a display screen DS. This keypad will include a multiplicity of different keys for requesting the various entertainment and service facilities offered by the system, and the microphone MA and headphones HP may be utilised in telephone communications between the passenger and other parties.

Referring now to Figure 4 of the drawings, three in-line aircraft seats are shown at S1, S2 and S3. The seat-backs are provided with display screens DS1, DS2 and DS3 which may comprise liquid crystal display screens. The wiring for these display screens which extends from the seat box SCB1 will be incorporated in the passenger seats S1, S2 and S3. The hand-held control pad KP is connected by a cable CL to the arm rest AR of the passenger seat immediately behind the

2033054

24

seat S2, it being understood that the passenger terminals PST1, PST2 and PST3 effectively incorporate the three passenger seats directly behind the seats S1, S2 and S3 shown in the drawing. The headphone HP for a passenger terminal will also be connected by cable to the arm rest of the seat of the terminal in question. In this way the cables for the headphones and the keypad will not normally obstruct the gangway between adjoining rows of passenger seats. Also, as shown in the drawings, the passenger trays can be retracted or lowered, as shown in the case of tray TR1, to act as a work surface for the hand held keypad KP, if required, without obscuring the display screen DS1.

As previously mentioned, the magnetic card reader CR may be embodied in the keypad KP or it could possibly be embodied in the display assembly on the seat back, and it will be used to accept payment for entertainment goods and services from credit, debit, chargecards etc. A security device may be provided to prevent other passengers gaining access to entertainment or services that have been paid for by a passenger, but not yet used when that passenger leaves their seat unattended for a period. The security device could be implemented as a magnetic card which carries passenger identity information (e.g. passenger address for mail order delivery). This magnetic card could be read by the card reader CR and normally held therein until the passenger removes it on leaving his seat. This card could be issued with, or as, the aircraft boarding pass.

The microphone MA forming part of the hand held keypad KP can be used for telephone communications. However, the microphone could alternatively be boom mounted on the headphones

HP. The headset or headphones HP is for listening to the audio part of entertainment facilities as well as acting as the receiver for telephone communications between parties and for service or safety announcements. Safety announcements will interrupt or over-ride all other services provided.

The keypad KP may also include a so-called mouse or other means for controlling a cursor or pointer on the display screen, such as the screen DS2 so that the passenger can point to the particular option or options required from a display menu of entertainment or services etc., in order to enter into the system the desired option selection. High level menus may be followed by sub-menus for more precise selection purposes. For example, if a passenger has opted to view a video, then the next menu to be displayed may provide a list of available titles and start times for videos and additional information may be called up if desired. The screen cursor may be in the form an animated character or icon which may be related for example to the installation operator or manufacturer and based on the company's logo or mascot, or it could be related to the category of sub-menu being displayed.

An attendant may access the system from the aisle adjacent to the position by connecting the attendant's portable terminal APT via a connector AX (Figure 4) to any of the seat communications boxes serving respective groups of three seats each. The attendant can then use the portable terminal equipment APT to enter into the system data on behalf of a passenger (e.g. to record cheque or cash payment for goods). The portable terminal equipment may

**2033054**

26

communicate with the communications box by cable, optical fibre or unguided optical transmission or by sonic transmission etc.

Although the display screens in the embodiment shown in Figure 4 are mounted in the backs of the seats directly in front of the viewers, the display screens could be mounted on a bulkhead partition in front of the seats concerned or on an articulated arm connected to one of the seat arms that can be folded away when not in use and adjusted for comfortable viewing or display of programme material or service information.

As will be apparent from a consideration of Figure 3, the wiring from the seat communications boxes, such as the box SCB1, to the seat terminals extends to the microphone MA and the card reader and the keypad KP in which the microphone and card reader are embodied, as well as to the headphones HP and the display screens, such as the screen DS1. Since this wiring extends from the seat communications box which may be located under a seat assembly, to components connected to positions on opposite sides of the gangway between the groups of seats at least some of the wiring concerned (e.g. the wiring between the seat communications box and the display screen for example) may be taken under the passenger cabin floor carpet between the sets of in-line seats, in order to avoid causing any obstruction of the gangway, whereas direct wiring connections are made between the communications box and the seat arm for the keypad, headphone etc.

According to another embodiment of the invention which is envisaged the need for such under-floor wiring which can complicate the installation by increasing the number of external connections to

the seat assembly and also the number of cable runs is obviated.

This objective is achieved as follows:-

In the system already described and illustrated, if a passenger requests a service or facility which is not provided locally by the appertaining seat communications box, such as the box SCB1, then the request concerned is transmitted to the appertaining zone concentrator, such as the concentrator ZC1, over the optical transmission path W8, whereupon the requisite data or programme material is switched through to the seat communications box SCB1.

However, in the proposed embodiment the switching algorithm utilised by the zone concentrator which receives such a request is such that the data or programme concerned is transmitted to the seat communications box for the seat immediately in front of the user (i.e. the seat incorporating the display screen). In this way all of the connections from a seat communications box to seat terminal components can be made internally of the seat structure, apart from the distribution network between the zone concentrator and the seat communications boxes, but no cabling is required between the groups of in-line seat assemblies.

This switching arrangement does not present any difficulties when video programmes are switched through to the seat communications box, but it does cause some complications where the material required is generated internally to the seat communications box. For example, the menu selection of facilities could be provided as a programme which is down-loaded to the seat communications box which accordingly allows the passenger user to select from the menu, whereupon the seat communications box transmits the

2033054

28

selection made to the appertaining zone concentrator. In the case of the modified switching arrangement to avoid under-floor wiring between groups of seats, the responses of the user will need to be passed back to the appertaining zone concentrator which will then route the message to the seat communications box handling the display. The limitation this modified switching arrangement imposes on the system is the removal of the ability to play fast interactive video games. Such programmes resident in the seat communications box, such as the box SCB1, depend on the fast reactions of the user to operate in a satisfactory manner, the delay resulting from sending a message to the appertaining zone concentrator, such as the concentrator ZC1, and back and then back to the seat communications box, such as the box SCB1, in front may be noticeable to the user and so render such games impracticable. This would not be a problem for more sedate games such as representations of chess, poker, etc.

From the foregoing descriptions of embodiments of the present invention it will be appreciated that the location of the display screen whether the screen is mounted on the back of the seat which is in front of the user's seat and which may incorporate a folded tray or whether the screen is mounted on an articulated arm forming part of the user's seat arm the screen can be viewed comfortably. Even with the seat back incorporating the display screen tilted, the screen can still be viewed comfortably.

Moreover, by connecting the keypad and the headphones by cable to the arm rest of the users seat the likelihood of the

2033054

29

connecting cables causing hazardous obstruction of the gangway between rows of seats is very much reduced.

Still further, the extensive use of optical transmission paths in the local area network for example between computers and zone concentrators, the possibility of electromagnetic interference with other aircraft systems is eliminated and the need for screening of the transmission system and special care during installation to reduce interference is thereby avoided.

As will be also appreciated the hierarchical system of the invention enables a considerable economy to be achieved in the provision of transmit/receive channels between different stages of the system since some data and other facilities are provided by the zone concentrators, all of which are coupled to main computers whilst further data and facilities (e.g. computer games programmes) may be provided by seat communications boxes which have restricted access to zone concentrators. In contrast to the previously-mentioned European Patent Application No. EP 0 277 014 all the programmes and services material is not made available to all the passenger seats all the time. Only the data requested by a passenger plus any system information, such as announcements, are transmitted to a seat terminal, such as the terminal PST1, thus requiring reduced bandwidth over the channel and allowing the use of lower cost components and providing for considerable expansion capability.

Although the invention has been described as applied to an integrated flight entertainment and services system in aircraft it will be realised that the system could also be applied to seat terminals in hotels, stadiums etc.

2033054

30

CLAIMS:

1. An integrated entertainment and services system for providing a range of selected entertainment and services at a multiplicity of specific terminal (e.g. seat) locations in a passenger-carrying vehicle (e.g. aircraft) or other installation (e.g. hotel or stadium), in which the system comprises an hierarchical structure including upper level data base/computer, communications switching and entertainment programme source equipment, in which access to these top level equipments is afforded the multiplicity of terminal locations through a plurality of intermediate switching and data storage equipments each of which is accessible to a group of lower level switching and data storage equipments serving respective groups of terminal locations of the system each of which includes a visual display screen and a controller device for selection of entertainment or one of the services provided.
2. An integrated entertainment and services system as claimed in claim 1, in which the intermediate switching equipments comprise zone concentrators including computers and appertaining to different zones of the system installation.
3. An integrated entertainment and services system as claimed in claim 1 or 2, in which the lower level of switching equipments comprise communications boxes including computers and other equipment.



4. An integrated entertainment and services system as claimed in any preceding claim, in which the entertainment programme source equipment provides public address and selectable entertainment video and audio facilities to the terminal locations and in which the entertainment programme source equipment is coupled to the intermediate switching equipment.
5. An integrated entertainment and services system as claimed in any preceding claim, in which at least the relatively long interconnections between the different levels of equipments are provided by optical transmission paths in order to preclude electromagnetic interference with other nearby systems.
6. An integrated entertainment and services system as claimed in any preceding claim, in which the communications switching equipment provides for speech communications between terminal locations; between terminal and external locations; or both, separately or concurrently.
7. An integrated entertainment and services system as claimed in any preceding claim, in which the system is accessed by means of a two dimensional cursor and controller means for selecting various options and sub-menus from displayed entertainment/services menus.
8. An integrated entertainment and services system as claimed in claim 7, in which the cursor is a graphic arrangement relating to the

**2033054**

32

installation (e.g. logo or mascot) or to the subject matter of the menu being displayed.

9. An integrated entertainment and services system as claimed in any preceding claim, in which at least one of the terminal locations includes a seat back display screen and provides for attachment of a headset, keypad controller etc to the arm of the seat occupied by the user with separate hidden (e.g. underfloor) cabling to the display screen so as not to impede access to aisles from seats.

10. An integrated entertainment and services system as claimed in any preceding claim, in which security provisions are provided as by the use of a magnetic card to restrict operation of the system to authorised users and in which the magnetic card may be receivable by a magnetic card reader embodied in a user keypad.

11. An integrated entertainment and services system as claimed in any preceding claim, in which at least some of the upper level equipments (e.g. main computers) are duplicated to provide back-up equipments for providing a continuing service in the event of break down of the primary equipment.

12. An integrated entertainment and services system as claimed in any preceding claim, comprising at least one attendant's portable terminal which affords the attendant access to the intermediate switching equipments.

13. An integrated entertainment and services system as claimed in any preceding claim, in which the user at a terminal location has access to one or more of the following:  
information services, interactive video or casino games, selection of video programmes, selection of audio programmes, making of reservations for hotels, car hire etc, mail order purchases, purchase of goods for delivery to terminal or otherwise, Bureau de Change facilities, word processing or other business package facilities.
14. An integrated entertainment and services system as claimed in claim 1, in which the visual display screen (e.g. liquid crystal screen) is attached to an articulated arm connected to the arm of a user's seat at the terminal location.
15. An integrated entertainment and services system as claimed in claim 1, in which the display screen (e.g. liquid crystal screen) is attached to a bulkhead in front of the users seat.
16. An integrated entertainment and services as claimed in claim 2, in which the lower level of switching and data equipment includes seat communications boxes each of which serves a group of seat terminals, in which each of the seat terminals has the visual display screen located in front of the usual seat and includes headphones and the controller connected by cable to the user's seat (e.g. arm rest) and in which the zone concentrator appertaining to the user's seat directs requested or other data to be displayed on the user's screen to the seat communications box appertaining the seat in front of the user

**2033054**

34

seat in order to avoid necessity of providing cabling between in-line seats that could constitute a hazardous obstruction when users move between such seats and simplifying installation.

17. An integrated entertainment and services system as claimed in any preceding claim in which means are provided for collecting usage statistics.

18. An integrated entertainment and services system as claimed in any preceding claim in which a point of sale terminal is provided for at least one seat position in a passenger carrying vehicle.

19. An integrated entertainment and services system substantially as hereinbefore described with reference to the accompanying drawings.

1/4

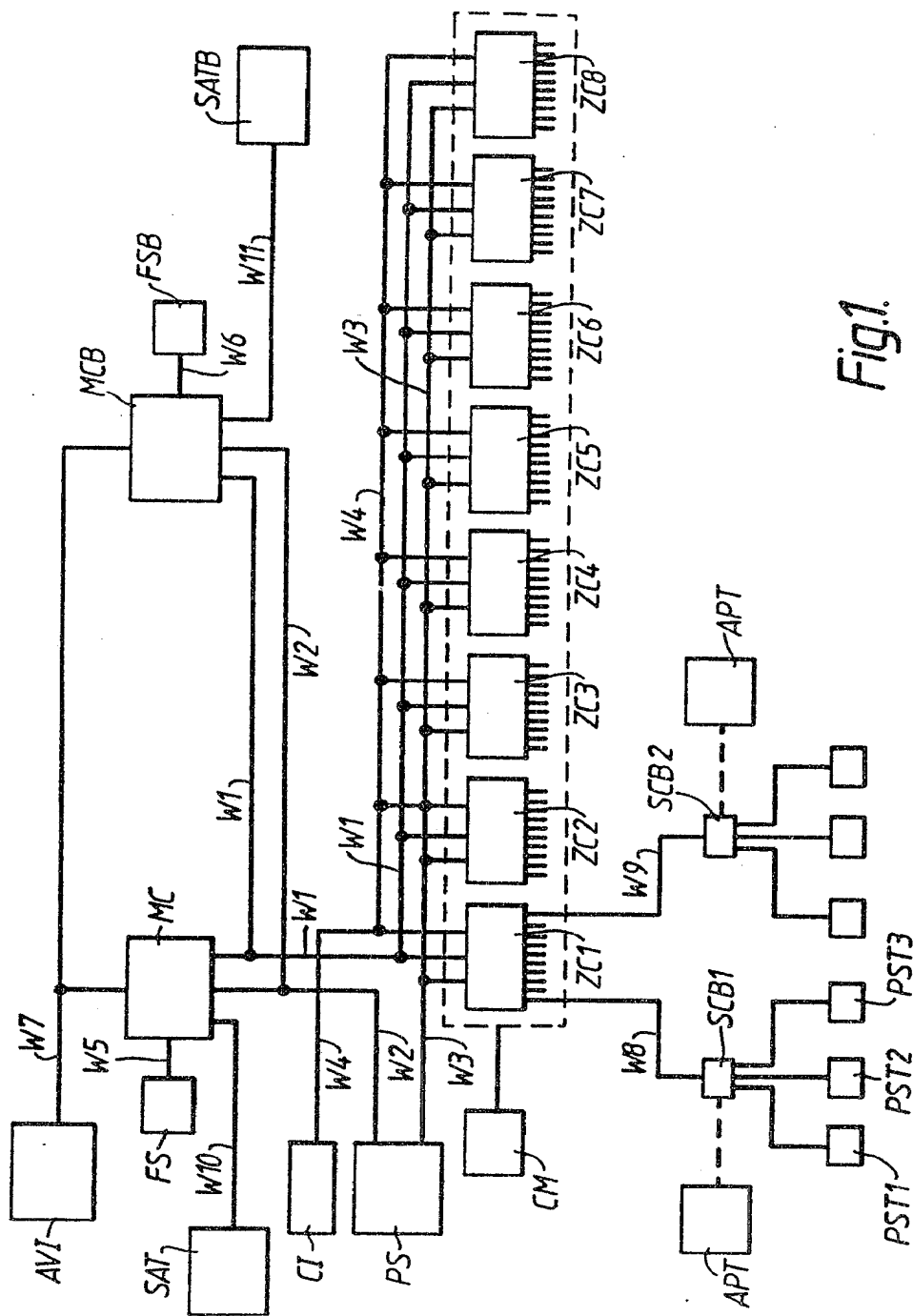


Fig. 1

SUBSTITUTE SHEET

2/4

2033054

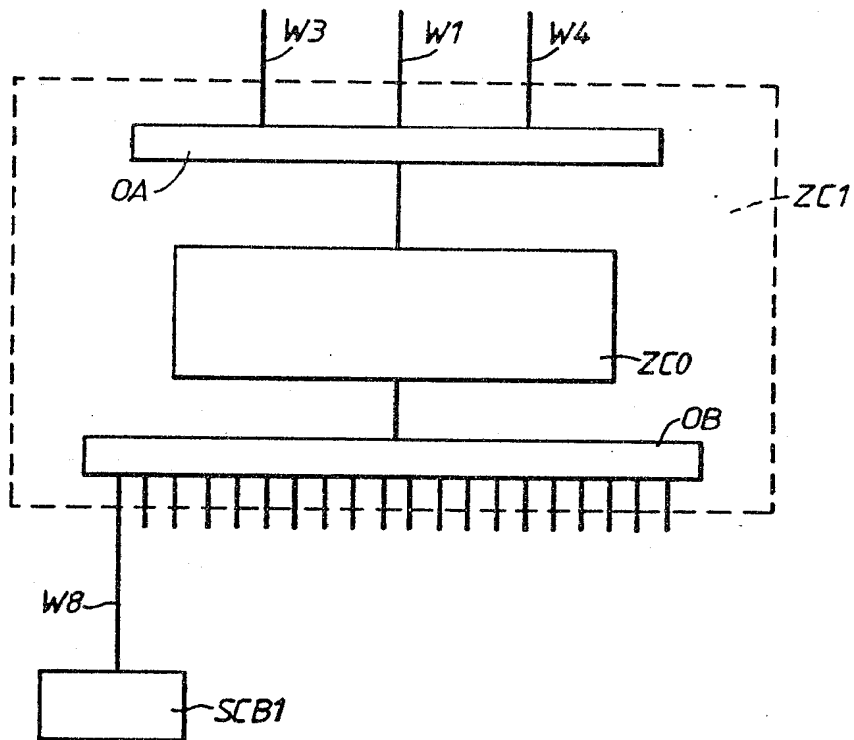


Fig.2.

SUBSTITUTE SHEET

3/4

2033054

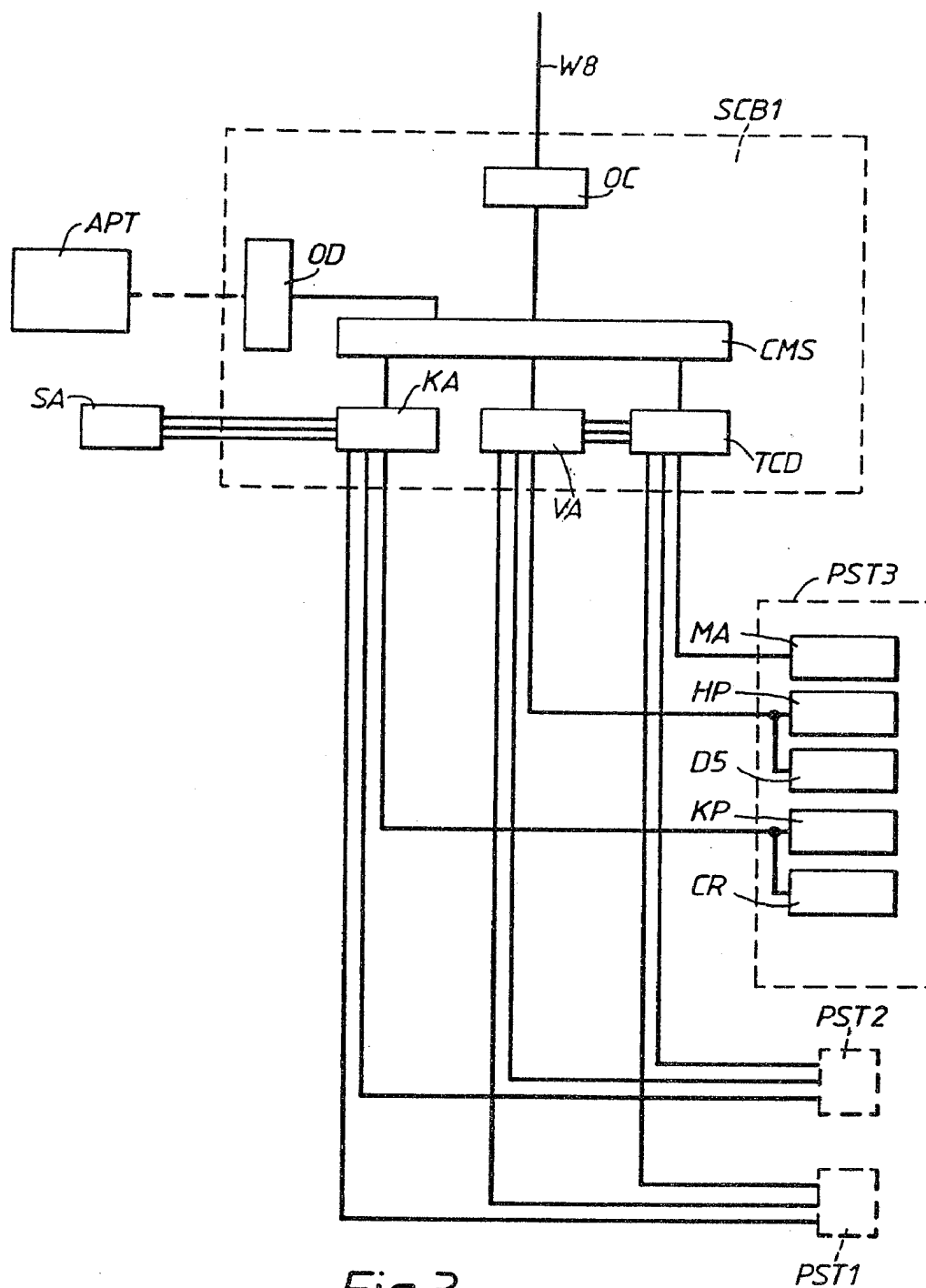
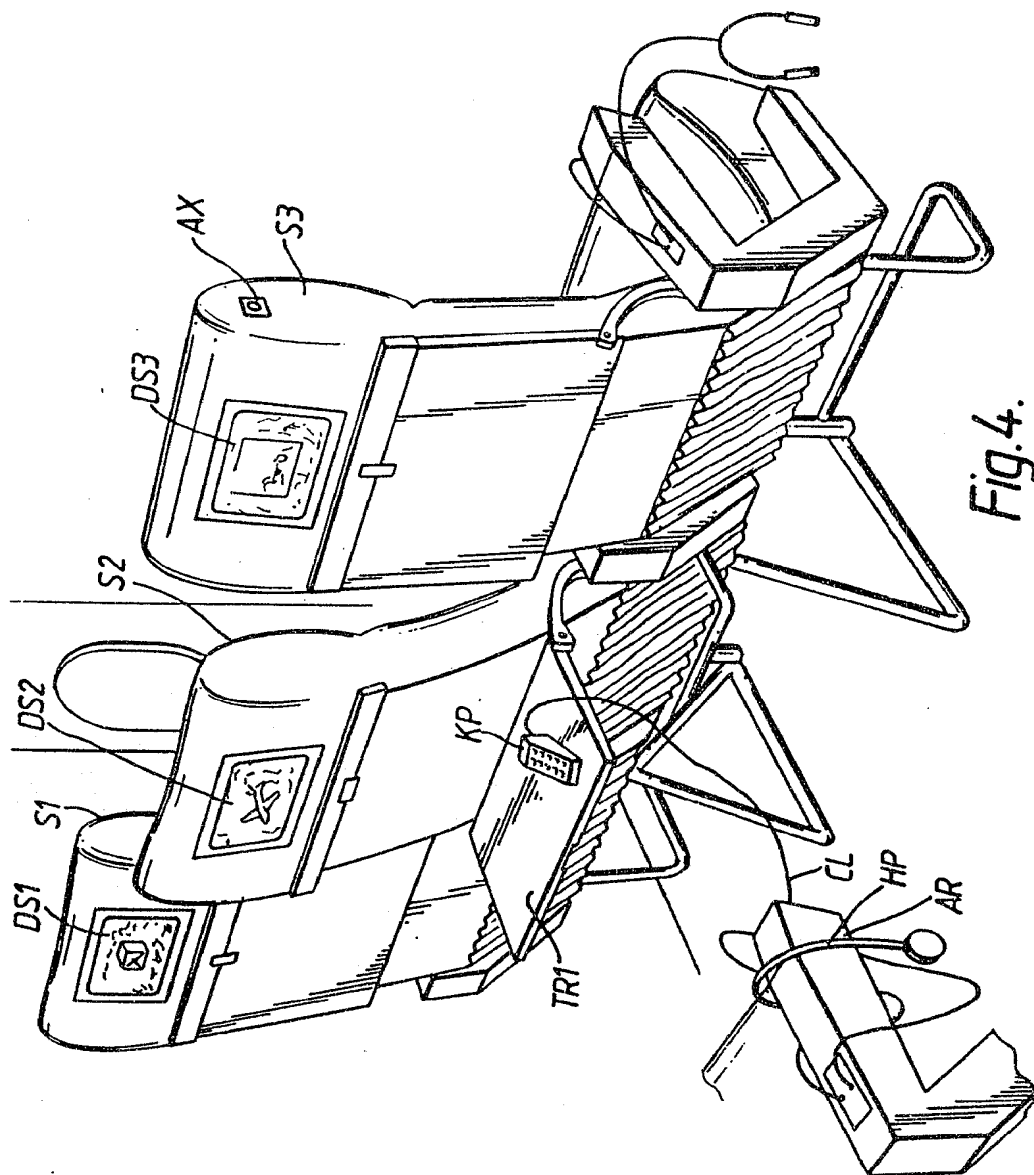


Fig.3.

SUBSTITUTE SHEET

4/4

2033054



SUBSTITUTE SHEET